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ORIGINAL ARTICLE

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Primary bipolar hemiprosthesis for unstable intertrochanteric fractures

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Abstract Between 1997 and 2001 we treated 54 elderly patients with unstable intertrochanteric fractures by primary hemiarthroplasty using a cemented bipolar prosthesis. Mean patient age was 75.6 (64–91) years and mean follow-up was 22.3 (5–48) months. Seven patients died before the fourth post-operative month. Thirty-three patients were able to walk with a walker in the first post-operative week. There were no dislocations or aseptic loosening. One deep infection was encountered after 1 year. Acetabular erosion was seen in one patient and non-union of the greater trochanter was seen in four. Five patients experienced leg-length discrepancy. We obtained 17 excellent and 14 good results after 12 months according to the Harris hip-scoring system. We observed that the inner motion of the bipolar head decreased over time.

Résumé Entre 1997 et 2001 nous avons traité 54 malades âgés avec fracture intertrochanterienne instable par hémiarthroplastie utilisant une prothèse bipolaire cimentée. L'âge moyen des malades était 75.6 (64–91) années et le suivi moyen étaient 22.3 (5–48) mois. Sept malades sont morts avant le 4e mois post-opératoire. 33 malades étaient capables de marcher avec un déambulateur pendant la première semaine post-opératoire. Il n'y avait pas de luxation ni de descellement aseptique. Une infection profonde s'est manifestée après une année.Une érosion acétabulaire a été notée chez un patient et une non – consolidation du grand trochanter chez quatre patients. Cinq malades avaient une inégalité de longueur des membres inférieurs. Nous avons obtenu 17 excellents et 14 bons résultats après 12 mois d'après le score de Harris. Nous avons observé que le mouvement intérieur de la tête bipolaire a diminué avec le temps.

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Introduction

Although the general treatment for unstable intertrochanteric femoral fractures is open reduction and rigid fixation, complications associated with internal fixation have made researchers look for other treatment modalities [2, 5, 6, 16]. We have used the Leinbach hemiprosthesis with a bipolar modular head (Protec, Sulzer Orthopedics, Switzerland) in the treatment of unstable intertrochanteric fractures in the elderly. In this study we present our early results with this method.

Material and methods

Between August 1997 and September 2001, 54 patients with unstable comminuted intertrochanteric hip fractures and osteoporosis were treated by primary hemiarthroplasty with the Leinbach bipolar prosthesis. There were 34 women and 20 men with an average age of 75.6 (64–91) years. The Singh index was grade 3 in seven patients, grade 2 in 21, and grade 1 in 26. According to the Kyle-Gustilo classification seven patients had a type IV fracture, 43 a type III, and four a type II. Average interval between occurrence of fracture and hospitalisation was 1.4 days and average interval between hospitalisation and operation was 5.7 days. Numerous medical problems were noted upon admission, including hypertension, diabetes mellitus, heart disease, neurological disease, haematological disease, oncology disease, lung disease and others.

The Leinbach stem forms the femoral component of the prosthesis. Its head-neck angle is 135° and is available in two standard stem lengths. The Protec bipolar head is made up of the outer shell, an insert and the metal head. To form the bipolar head the head is fitted into the polyethylene insert and then the head-insert combination is fitted into the outer shell. The system will lock itself up (Fig. 1).

Operative technique

We used a posterolateral modified Gibson approach. Anteversion – retroversion of the prosthesis – was determined using the lesser trochanter as a guide after temporarily reducing the lesser trochanter anatomically. Determination of length was made by temporarily fixing the greater trochanter in its anatomical position. The fractured trochanter was attached to the prosthesis with one or two stainless steel wires (Fig. 2a and b). Bone cement was used in all cases.

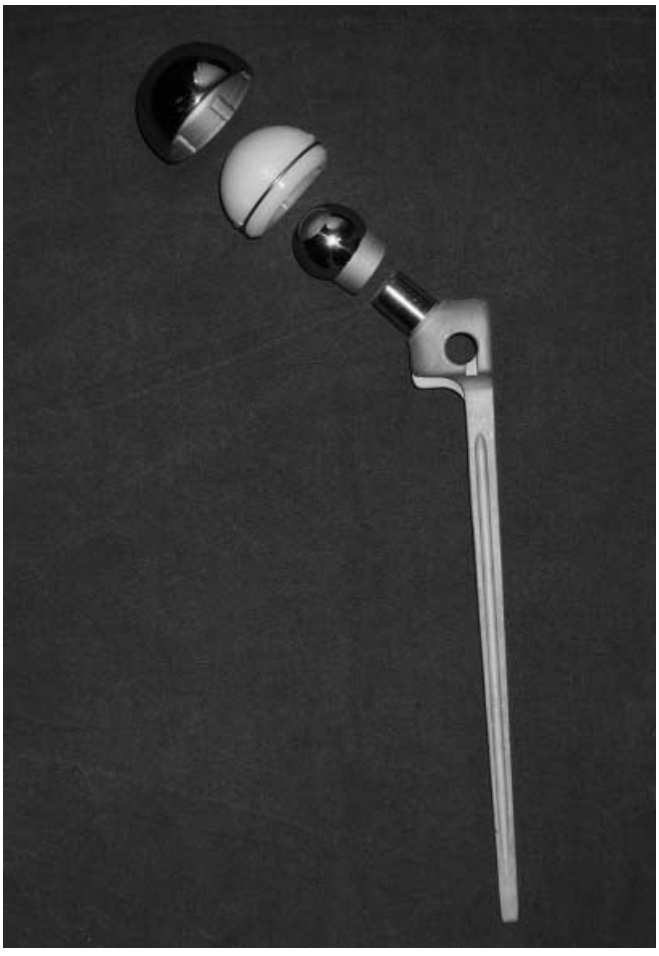

Fig. 1 Components of the Leinbach bipolar hemiprosthesis

Prophylactic first-generation cephalosporin and low-molecular-weight heparin (enoxaparin) was started 12 h before operation. Walking exercises were started on the second post-operative day.

Patients were followed in 3-month intervals for the first year and 6-month intervals in the second year. During the follow-up patients were evaluated according to the Harris hip-scoring scale. We used the Gingras criteria in determining radiographic loosening [4]. For acetabular erosion the distance from the head of the prosthesis to the superior dome of the acetabulum was measured on the immediate post-operative and follow-up roentgenograms [14, 19].

To determine movements of the bipolar head we measured the angle between a line parallel to the edge of the outer cup and a line parallel to the longitudinal axis of the femoral stem. We measured the angle between these two lines with the hip in neutral position and in 45° of abduction [1, 12] (Fig. 3a and b).

Results

Average follow-up was 22.3 (5–48) months. Mean operation time was 40 min; mean peri-operative blood loss was 185 ml±120 ml. Two patients died due to pulmonary embolism, one due to myocardial infarction and one due to malignancy. Moreover, three patients died before the fourth post-operative month, but the cause of death was not established. Final mortality rate was 12.9%.

Table 1 Functional results from third to 48th post-operative month in surviving patients using Harris hip score

Months	3rd	6th	9th	12th	18th	24th	36th	48th
Excellent	21	20	18	17	15	14	4	–
Good	18	18	16	14	13	11	3	1
Fair	5	4	3	3	3	3	1	–
Poor	6	4	4	3	3	3	–	–
Total	50	46	41	37	34	31	8	1

Table 2 Movements of the inner surface of the bipolar head during follow-up

Months	3rd	6th	9th	12th	18th	24th	36th	48th
Number of patients	50	46	41	37	34	31	8	1
Mean degree of motion	14.3	10.6	9.2	7.6	5.3	4.9	4.5	4.1

Deep infection developed in one patient during the 13th month post-operatively, and the prosthesis was removed 1 year later. There was one case of acetabular erosion, four patients with non-union of the greater trochanter and five with leg-length discrepancy due to high seating of the prosthesis. In two patients we found the cerclage wire used for the greater trochanter had broken. There was no dislocation or aseptic loosening.

In the first post-operative week 62% of the patients were able to walk with a walker and 98% were ambulatory when discharged from hospital. Our functional results are listed in Table 1. Success rates were unchanged during the follow-up period. We observed that the inner motion of the bipolar head decreased over time (Table 2).

Discussion

Displaced, unstable, severely comminuted intertrochanteric fractures are not easy to treat. Using Ender nails or older non-sliding implants, complication rates up to 50% have been reported [3, 7]. According to Sarmiento [15], by valgus osteotomy or by combination of osteotomy with bone cement [13] the mechanical complication rate can be reduced to 15%. Currently, general consensus is that internal fixation using a dynamic hip screw (DHS) device is the treatment of choice [8, 10]. Such an implant will tolerate greater weight-bearing forces than static devices [9]. Nevertheless, in elderly people with osteoporosis and complex intertrochanteric fractures, this technique does not allow for unrestricted weight bearing [20], and failure rates between 5% and 12% have been reported [10, 11]. For these reasons some authors favour the use of endoprosthesis, which will allow early weight bearing with a lesser risk of mechanical problems.

Stern and Goldstein [17] reported on 29 patients with intertrochanteric fractures treated with the Leinbach

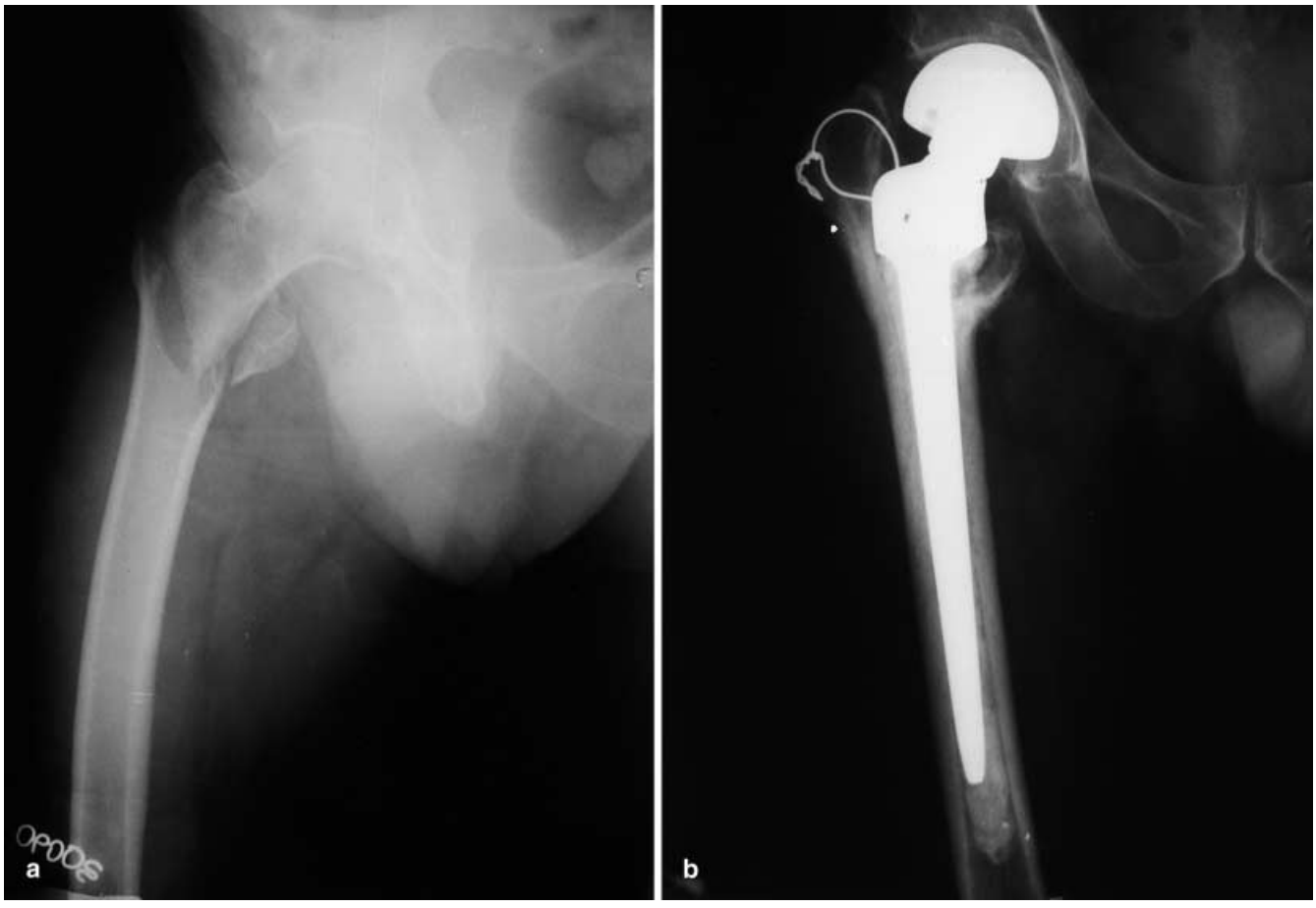

Fig. 2 **a** Pre-operative X-ray. **b** Postoperative X-ray at 36 months

prosthesis with excellent results in 88%. They reported a deep infection rate of 6.8% but no dislocations. Stern and Angerman [16] reported on 105 cases of unstable intertrochanteric femoral fractures treated with Leinbach prosthesis. They reported a deep infection rate of 2.8% but made no comments on dislocations. They obtained a 94% success rate in returning the patient to the pre-fracture ambulatory status.

The Leinbach prosthesis with a solid head may accelerate wear of the acetabular cartilage [18]. For this reason some authors preferred to use a bipolar femoral prosthesis that could be converted to a total hip replacement [2, 5, 6]. Green [5] reported on 17 patients who had a primary head-neck bipolar prosthetic replacement for unstable intertrochanteric femoral fractures. Average patient age was 82.2 years, average time to ambulation was 5.5 days, and average follow-up time was 13.2 months. The mortality rate was 20% at the end of the first year. Two patients had non-union of the greater trochanter. Overall results were uniformly good with no infections or dislocations. Harwin [6] reported on 58 elderly osteoporotic patients with comminuted intertrochanteric femoral fractures treated with a bipolar Bateman-Leinbach prosthesis. They were followed for an average of 28 months. Average patient age was 78 years, and 91% ambulated prior to discharge. Two patients had non-union of the greater trochanter. There were no deep infections, dislocations, acetabular erosion or stem loosening. Broos [2] reported on 94 elderly patients with acute intertrochanteric femoral fractures treated with a bipolar Vandeputte prosthesis. Average patient age was 75 years. At the end of 1 year the authors compared their results with the results of other groups treated either by Ender nail, angled plate or DHS. They found that the average operating time was shorter, mortality and complication rates lower and functional results better in the bipolar hemiarthroplasty group. There were no dislocations, deep infections, acetabular erosion or stem loosening.

In our series we obtained excellent and good results in about 80% of cases using the Harris hip-scoring system, and, although the inner motion of the bipolar head decreased 70% by the end of the third year postoperatively, this rate stayed unchanged during this period. There were no dislocations or stem loosening. In the short term, unipolar or bipolar hemiarthroplasty seem to give better results than open reduction and internal fixation in the treatment of unstable intertrochanteric hip fractures in terms of mortality and morbidity rates, complications, early rehabilitation and returning to daily living activities. Long-term problems such as loosening, protrusio, stem failure, late infections and late dislocations have not been seen in these series. While these theoretically are potential problems they are seen usually

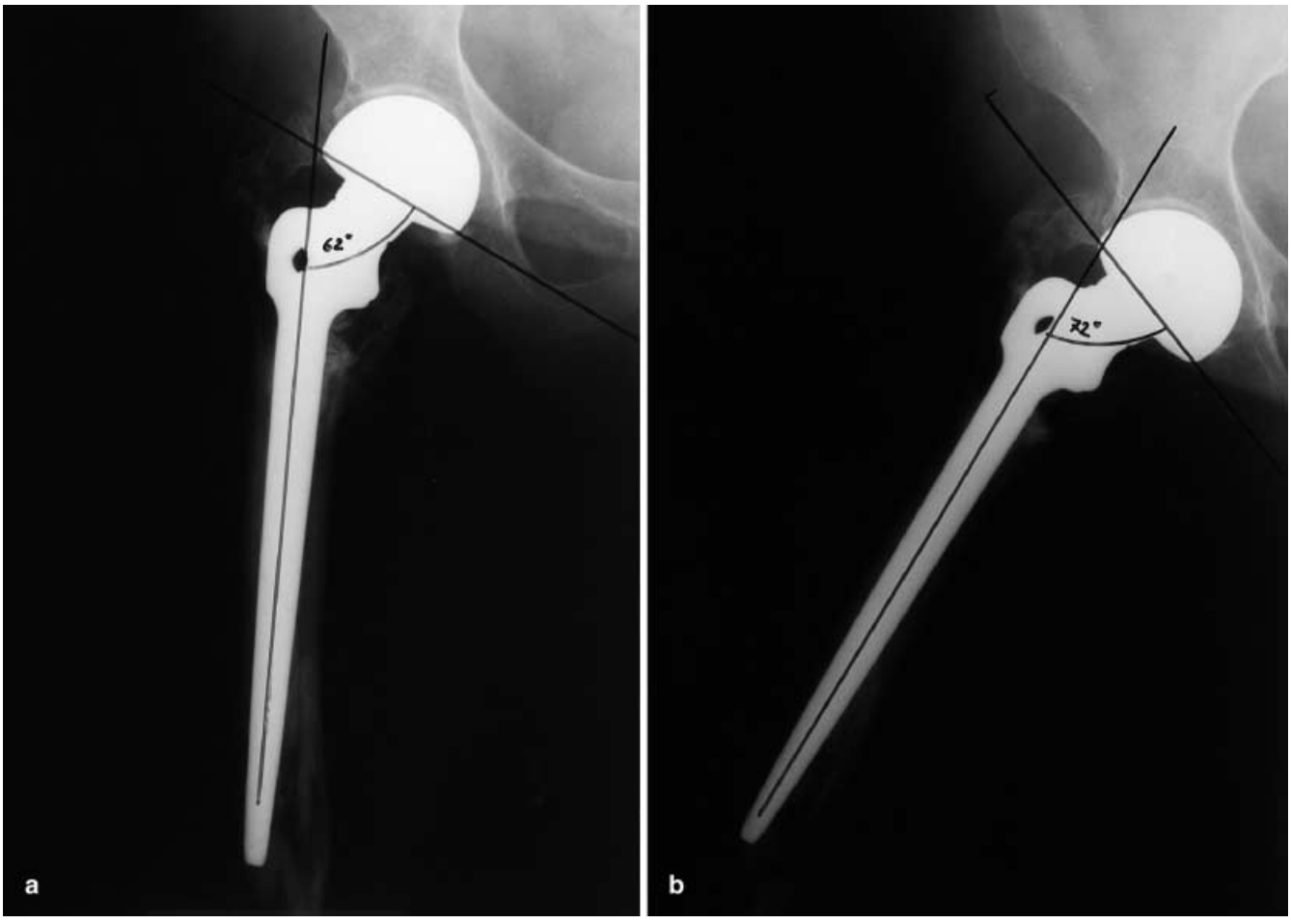

Fig. 3 **a** Measurement of inner motion of the bipolar component, AP X-ray with hip in neutral position. **b** AP X-ray with hip in 45° abduction

years after the surgery. Although the average patient age in these series was between 74 and 82 years, shorter-term complications seem to be more important than long-term ones. Because life expectancy increases in all countries, long-term disadvantages of the hemiarthroplasty may outweigh its short-term advantages.

Results of primary unipolar or bipolar prosthetic arthroplasty for unstable intertrochanteric fractures cannot be compared with the outcomes reported for internal fixation of similar injuries without a prospective randomised study. We anticipate further reports of our work in the future.

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